

**CHARGED-PARTICLE-BEAM MAPPING PROJECTION-OPTICAL  
SYSTEMS AND METHODS FOR ADJUSTING SAME**

**Abstract of the Disclosure**

5           Charged-particle-beam (CPB) mapping projection-optical systems and  
adjustment methods for such systems are disclosed that can be performed quickly  
and accurately. In a typical system, an irradiation beam is emitted from a source,  
passes through an irradiation-optical system, and enters a Wien filter ("E×B").  
Upon passing through the E×B, the irradiation beam passes through an objective-  
10   optical system and is incident on an object surface. Such impingement generates  
an observation beam that returns through the objective-optical system and the E×B  
in a different direction to a detector *via* an imaging-optical system. An adjustment-  
beam source emits an adjustment beam used for adjusting and aligning the position  
of, *e.g.*, the object surface and/or the Wien's condition of the E×B. The adjustment  
15   beam can be off-axis relative to the objective-optical system. For such adjusting  
and aligning, fiducial marks (situated, *e.g.*, in the plane of the object surface) can  
be used that are optimized for the CPB-optical system and the off-axis optical  
system. Desirably, the image formed on the detector when electrical voltage and  
current are not applied to the E×B is in the same position as the image formed on  
20   the detector when electrical voltage and current are applied to the E×B. Also  
provided are "evaluation charts" for use in such alignments that do not require  
adjustment of the optical axis of the irradiation-optical system, and from which the  
kinetic-energy distribution of the emitted adjustment beam is stable.